**Performing Lumbar Puncture in Patients over 16 years old**

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<th>Clinical Guideline</th>
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**Consulted With**

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<td>Dr Anser Qureshi</td>
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**Related Trust Policies (to be read in conjunction with)**

**Document Review History**

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It is the personal responsibility of the individual referring to this document to ensure that they are viewing the latest version which will always be the document on the intranet.
1. **Purpose and Aims of the Guideline**

1.1 Lumbar puncture is a safe, extremely useful and important investigation but it is not without risk. If it is not performed correctly, it can lead to serious complications. Therefore the purpose of this guideline is to provide information to junior doctors concerning the lumbar puncture procedure and enable the following:

- Aid decision-making
- Know what supervision is required
- Understand consent issues
- Know the indications and the contraindications
- Aid technique
- Understand timing issues
- Know about sample collection
- Patient Information issues

1.2 Spinal anaesthesia and intra-thecal administration of antibiotics and chemotherapy are outside the scope of this guideline

2. **Introduction**

2.1 Lumbar puncture is a procedure to obtain cerebrospinal fluid (CSF) for analysis. It is performed to diagnose and/or treat CNS (Central Nervous System) disorders such as meningitis, subarachnoid haemorrhage, multiple sclerosis, benign intracranial hypertension and CNS malignancy.

2.2 The decision to perform LP **must** be made by Registrar or Consultant.

2.3 Lumbar puncture should be carried out by a competent and experienced doctor, registrar and above. However, it can be done by junior doctors (FY1, FY2, CT 1-2) under supervision for training purpose (if the patient agrees) or if he/she has adequate experience which must be first agreed by a Senior doctor.

3. **Scope**

3.1 **Indications**

LP should be considered in the following conditions;

3.1.1 **Urgent**

- Suspected CNS infections (meningitis,encephalitis) except meningococcal sepsis/meningitis and suspected brain abscess (needs brain imaging/CT before LP)
- Suspected Subarachnoid haemorrhage (SAH) if CT scan is normal. It should be delayed after 12 hour of onset.

3.1.2 **Non-urgent**

- Suspected Guillain-Barré syndrome
- Multiple Sclerosis
- Benign/ Idiopathic Intracranial Hypertension
- CNS malignancies and carcinomatous meningitis
3.2 Contraindications

LP should not be performed on patients with the following conditions. Note that it may be performed in some circumstances but another action must be taken before LP can take place;

3.2.1 Patients with coagulopathy

- Abnormal clotting results e.g. INR > 1.4 (coagulopathy must be corrected before LP if it is a must)
- On anticoagulant therapy
- Suspected meningococcal sepsis
- Thrombocytopenia (Platelet count < 80)
- Patients on clopidogrel – LP should be deferred for 2 weeks

3.2.2 Suspected raised intracranial pressure (↑ICP) or space occupy lesion (SOL) as evidenced by (CT brain must be done before LP):

- Reduced conscious level [GCS < 13 or fluctuating GCS (>2)]
- Seizures
- Focal neurological deficits
- Papilloedema
- Cushing’s reflex (hypertension and bradycardia)
- Abnormal pupils/ pupil reactions

3.2.3 Infection of the skin over LP area

3.2.4 Spina-bifida

3.2.5 Haemodynamically unstable patients – LP can be done after stabilisation

3.2 CT Brain before LP

3.2.1 Not all patients with suspected meningitis require CT head before LP can be performed. Thorough history taking and physical examination is essential to assess conscious level (GCS), seizures, focal neurological deficit and signs of raised intracranial hypertension.

3.2.2 A normal CT scan does not exclude raised intracranial pressure.

3.2.3 Patients with following clinical features need CT brain before performing LP3

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<thead>
<tr>
<th>History</th>
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<tr>
<td>Age ≥ 60 years</td>
<td>Abnormal level of consciousness (GCS &lt;13)</td>
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<tr>
<td>Immunocompromised</td>
<td>Focal neurological deficit</td>
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<tr>
<td>History of central nervous system disease</td>
<td>Signs of raised ICP</td>
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<tr>
<td>History of seizure within one week before presentation</td>
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3
4. **Informed Consent**

4.1 Patients must be consented before the procedure using the appropriate consent form.

4.2 Establish capacity for all vulnerable patient groups with special consideration to patients with learning disabilities, autism and mental health issues. For patients with learning disabilities or autism, it is recommended that you contact the Hospital Liaison Nurse Specialist.

4.3 If the patient lacks capacity, Mental Capacity Act 2005 must be applied (MCA 2 form must be completed) and it should be done for the best interest of the patient.

4.3 Explain the procedure, intended benefits and potential complications to patient. Potential complications include low-pressure headache/ post-LP headache (up to 30%), back pain, bleeding, infection, epidermoid tumor, Abducen nerve palsy (transient) and cerebral herniation.

5. **Technique**

5.1 **Position**

5.1.1 **Lateral recumbent** (essential for measuring opening pressure)

- Patient's neck, back, and limbs are held in flexion.
- The lower lumbar spine should be flexed with the back perfectly perpendicular to the edge of a bed or examining table.
- The hips and legs should be parallel to each other and perpendicular to the table.

5.1.2 Sitting upright

5.2 **Needle**

- Type (atraumatic or cutting)
- Size – 22 G or smaller (bigger needles are associated with post-LP headache)

5.3 **Disinfectant**

5.3.1 The overlying skin should be cleaned with 3% chlorhexidine. If iodine is used, the skin should be cleaned with saline as the iodine is neurotoxic. A sterile drape with an opening over the lumbar spine is then placed on the patient.

5.4 **Determining the level of entry of the spinal needle**

5.4.1 Identify the fourth lumbar vertebral body - a line joining the highest points of the posterior superior iliac crests

5.4.2 Identify the spinous processes of L3, L4, and L5, and the interspaces

5.5 **Local Anaesthetic agent**

5.5.1 Up to 5ml of 2% lignocaine should be infiltrated starting with an orange needle intradermally / subcutaneously to infiltrate skin, waiting for it to take effect and then infiltrating deeper with a green needle. The syringe should always be pulled back prior to injection of lignocaine to ensure not in blood vessel or CSF (e.g. in thin patient). Allow time for this to be effective.
5.6 Needle insertion

5.6.1 Advance a spinal needle (with a stylet) into either L3/4 or L4/5 interspace at midline. The spinal needle should be aimed towards the umbilicus and the flat surface of the bevel of the needle should be positioned to face the patient's flanks.

5.6.2 At a depth of about 5 cm, more firm resistance may be encountered as the ligamentum flavum is reached. Beyond this, there is a slight ‘give’ as the needle punctures the dura. The stylet is removed and clear CSF will come out of the needle if this has been correctly positioned.

5.6.3 Measure and record CSF pressure (in lying position) using a manometer

5.7 Sample collection

5.7.1 It is good practice to take 4 tubes and to fill them each by at least 5ml. All bottles need to be carefully labelled with correct patient details. They should be numbered 1 to 4 according to the order they were filled. If there is diagnostic doubt, it is often helpful to ask the lab to put a sample aside temporarily in case further tests are needed.

5.7.2 Routine samples - CSF for microscopy and sensitivity, protein, paired sugar (blood +

5.7.3 CSF – fluoride bottles), and cytology.

5.7.4 For suspected CNS inflammation (e.g. MS) - paired blood + CSF for oligoclonal bands (OCB's)

5.7.5 Bloody tap - take 3 sequential tubes of CSF to establish whether the fluid is uniformly blood stained or whether initial blood stained CSF clears as a result of a traumatic tap.

5.7.6 For suspected SAH, CSF should always be analysed by spectrophotometry to look for xanthochromia. It is important not to perform the LP within 12 hours of the suspected bleed, as time is required to assess presence of xanthochromia.

5.7.7 Other tests – CSF lactate, bacterial antigen, antibodies, PCR, ACE

6. Difficult Lumbar Puncture

6.1 If no fluid appears or bone is encountered, it is probable that the needle is not in the correct position. The stylet should be reinserted, the needle partially withdrawn and then advanced with a slightly different angle.

6.2 The commonest causes of failure are that the needle is not in the midline, the patient’s back is not perpendicular to the bed (e.g. twisted at shoulders, or legs not together) or is at too great an angle with the skin.

6.3 If unsuccessful after 2 attempts, discuss with an anaesthetist for help. If that is unsuccessful, X-ray screening may be used.

6.4 If LP is to evaluate presence of xanthochromia, then further attempts need to be performed at this time and not delayed by more than 2-4 hours, otherwise altered blood may be found as a consequence of traumatic tap and the test becomes unhelpful if xanthochromia is found. If there are significant number of red cells from a traumatic tap, as a guide about 10 white cells/7000 red cells would normally be expected.
6.5 **Finishing the Lumbar Puncture**

6.5.1 When the CSF samples have been collected, it is essential to replace the sterile stylet before removing the LP needle. Failure to replace this is one of the main causes of post LP headache.

6.6 **After care**

6.6.1 There is no good evidence to suggest that lying down following an LP is helpful at preventing post LP headache. Good hydration is sensible, although not proven to prevent headache. Oral caffeine is not to be recommended as it does not prevent post LP headache and may actually induce perpetual caffeine-related headache in those predisposed.

6.6.2 For elective admission for LP, patient should be observed for 4-6 hours. Patients may be suitable for discharge if they are well, ambulant and can get bed-rest at home. If a post LP headache occurs, good hydration, bed rest and analgesia should be the first line treatment. If it persists, patient should be referred to anaesthesia for blood patch treatment.

7. **Doctor Training**

This procedure is part of the junior doctors local induction training with records maintained by Medical Staffing.

8. **Managing Policy Breaches**

All clinical incidents that result in patient harm must be reported on Datixweb, the trust’s risk event reporting system.

9. **Audit & Monitoring**

This guideline will be audited on an annual cycle with results reported to the Critical & Emergency Care Directorate meeting. Where the audit has identified deficiencies an action plan will be developed to address these and monitored monthly at the Critical & Emergency Care Directorate meetings.

10. **Implementation and Communication**

Corporate Services will ensure that the guideline is published on the intranet and website and notified to staff in Focus.

11. **References**

   [http://www.thewaltoncentre.nhs.uk/Library/documents/patient_information_leaflets/Guidelines_For_Performing_Lumbar_Puncture_In_Adult_v2.pdf](http://www.thewaltoncentre.nhs.uk/Library/documents/patient_information_leaflets/Guidelines_For_Performing_Lumbar_Puncture_In_Adult_v2.pdf)

   Early management of suspected bacterial meningitis and meningococcal septicaemia in immunocompetent adult (Second edition, British Infection Society and Meningitis Research Foundation), Journal of Infection February 2003, vol 46 (2)